

REMARKS

Claims 1-33 will be pending upon entry of the present amendment. Claims 15, 16, 25, 29 and 30 are being amended. New claims 31-33 are being added. No new matter is being presented. Support for new claim 31 and the changes to claims 16 and 25 can be found from page 12, line 18 – page 13, line 6.

One embodiment of the invention is directed to a method for determining a score characteristic of a definition of a digital image. The method includes cumulating quadratic norms of horizontal and vertical gradients of luminance values of pixels of the image to determine a cumulated total. In addition, the method chose the pixels for the cumulating step at least according to a comparison of a maximum luminance threshold to adjacent pixels in a concerned direction. In other words, when determining whether a particular pixel will be selected to have its gradient added to the cumulated total, the luminance values of pixels that are adjacent to the particular pixel are first compared to the maximum luminance threshold. If the luminance values of the adjacent pixels exceed the maximum luminance threshold, then the particular pixel will not have its gradient added to the total.

This feature of the method is highly advantageous for several reasons. The method is not limited to choosing pixels only at the boundary between an iris and a pupil of an eye. In the case that the method is applied to an image of an eye, the method may take into account the pixels of the iris as a whole. In this case the method can more effectively eliminate possible inaccuracies introduced into the definition score based on specular spots. A specular spot appearing in the image will have no effect on the definition score, because not only will the gradient of the pixels in the specular spot not be taken into account, but the gradient of any pixel too close to the specular spot will also not be added to the score. In addition to this, any other bright aberration in the image can effectively be prevented from causing a faulty definition score for the image.

Double Patenting Rejection

Claims 1-13, 15-19, 21-22, and 25 were provisionally rejected for obviousness-type double patenting in view of copending U.S. Application No. 10/717,804. Enclosed is a terminal disclaimer overcoming the rejection.

Obviousness Rejections

Choi and Zhang '440

Claims 1-7, 11, and 15-20 were rejected under 35 U.S.C. § 103 as being unpatentable over Choi (IEEE pub titled "New Auto-focusing Technique using the Frequency Selective Weighted Median Filter for Video Cameras") in view U.S. Patent No. 5,953,440 to Zhang et al. ("Zhang '440").

Choi and Zhang '440 do not teach or suggest the invention recited in claim 1. Claim 1 recites choosing the pixels for the cumulating step at least according to a comparison of a first maximum luminance threshold to adjacent pixels in a concerned direction. The Examiner admits that Choi does not teach suggest such a choosing step.

Zhang '440 also does not teach or suggest choosing pixels for the cumulating step at least according to a comparison of a first maximum luminance threshold to adjacent pixels. Instead, Zhang '440 teaches that the gradient of a pixel will be calculated if the gray scale value of that pixel falls within a certain range, i.e., between a median pupil value M_p and a median iris value M_i (col. 3, lines 18-22). Comparing a single gray scale value of the pixel being selected to the values M_p , M_i does not amount to a comparison of plural adjacent pixels to a maximum luminance value as recited in claim 1. At no point does Zhang '440 or Choi suggest choosing the pixels for the cumulating step at least according to a comparison of a first maximum luminance threshold to adjacent pixels in a concerned direction. Thus claim 1 is patentable over Zhang '440 and Choi.

Claims 2-7 and 11 depend on claim 1, and thus, are nonobvious for the reasons expressed above. In addition, Zhang '440 and Choi do not teach or suggest the features recited in claim 3. Claim 3 recites that the choosing step includes selecting a current pixel having a

vertical or horizontal gradient to be taken into account in the cumulated total only if the luminances of two pixels distant from the current pixel by a predetermined interval in the concerned direction are smaller than said first maximum luminance threshold. As discussed above, Zhang '440 selects a pixel for the gradient calculation only if the gray scale value of that same pixel is between M_p and M_i , regardless of whether any other pixels have gray scale values between M_p and M_i .

The applicants disagree with the Examiner's assertions on page 10 of the Office Action regarding claim 3. In particular, Zhang '440 does not select a current pupil pixel only if two iris pixels to the left and right of the pupil pixel are less than M_i and Zhang '440 does not perform a median threshold calculation based on a kernel of 3 to 5 pixels. Instead, col. 3, lines 18-20 states that the small kernel of 3-5 pixels is used to calculate the absolute value of the gradient of each pixel. In other words, the gradient of a selected pixel is calculated by comparing the selected pixels to the small kernel of 3-5 pixels. The calculation of the median values M_p and M_i is explained beginning at column 2, line 39 and uses all of the pixels of a selected defined in the equations at col. 2, lines 45-52. Column 3, lines 18-20 further state that the absolute value of the gradient is computed for "those pixels in the selected set having a gray scale value greater than M_p and less than M_i . Zhang '440 never suggests those pixels in the selected set having adjacent pixels of gray scale value greater than M_p and less than M_i are selected for the gradient calculation. Accordingly, claim 3 is nonobvious in view of Choi and Zhang '440.

Although the language of claims 15-20 is not identical to that of claims 1 and 3, the nonobviousness of claims 15-20 will be apparent in view of the above discussion.

Choi, Zhang '440, and Schwartz

Claims 8-10 were rejected under 35 U.S.C. § 103 as being unpatentable over Choi in view of Zhang '440 as applied to claim 1 in further view of U.S. Patent Application Publication No. 2002/0181746 to Schwartz et al. ("Schwartz").

The cited prior art does not teach or suggest the invention of claims 8-10, which depend from claim 1. In particular, Schwartz does not teach or suggest the features of claim 1

that are missing from Choi and Zhang '440. Instead, like Zhang '440, Schwartz only compares a selected pixel to a threshold rather than comparing pixels adjacent to the selected pixel to a threshold to choose the selected pixel for further processing. For at least this reason, claims 8-10 are all allowable.

Choi, Zhang '440, and Zhang '494

Claims 12-14, 21-22, and 29-30 were rejected under 35 U.S.C. § 103 as being unpatentable over Choi and Zhang '440 in view of U.S. Patent No. 5,978,494 to Zhang ("Zhang '494").

The cited prior art does not teach or suggest the invention of claims 12-14, which depend from claim 1. In particular, Zhang '494 does not teach or suggest the features of claim 1 that are missing from Choi and Zhang '440. Instead, Zhang '494 simply specifies using the method of Zhang '440 (see col. 2, lines 30-55). For at least this reason, claims 12-14 are all allowable.

Although the language of claims 21-22 and 29-30 is not identical to that of claims 12-14, the nonobviousness of claims 21-22 and 29-30 will be apparent in view of the above discussion.

Choi, Zhang '440, and Suzuki

The examiner rejected dependent claims 23-28 as being unpatentable over Choi in view of Zhang (US 5,953,440) as applied to claim 16 further in view of Suzuki (US 6,307,954).

The cited prior art does not teach or suggest the invention of claims 23-24, which depend from claim 16. In particular, Suzuki does not teach or suggest the features of claim 16 that are missing from Choi and Zhang '440. Instead, Suzuki compares distances between a selected pixel and other pixels. For at least this reason, claims 23-24 are all allowable.

Although the language of claims 25-28 is not identical to that of claims 23-24, the nonobviousness of claims 25-28 will be apparent in view of the above discussion.

New Claims

New claim 31 depends on claim 1 and claims 32-33 depend on claim 15. Accordingly, claims 31-33 are nonobvious for the reasons expressed above.

Conclusion

All of the claims remaining in the application are now clearly allowable. Favorable consideration and a Notice of Allowance are earnestly solicited.

The Director is authorized to charge any additional fees due by way of this Amendment, or credit any overpayment, to our Deposit Account No. 19-1090.

Respectfully submitted,
SEED Intellectual Property Law Group PLLC

/Robert Iannucci/
Robert Iannucci
Registration No. 33,514

Enclosure: Terminal Disclaimer

701 Fifth Avenue, Suite 5400
Seattle, Washington 98104
Phone: (206) 622-4900
Fax: (206) 682-6031

977266_1.DOC